UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
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BOSTON, MASSACHUSETTS 02114-2023

January 28, 2009

Shawn Cody, Director of Environmental Affairs
Massachusetts National Guard
Office of the Adjutant General
50 Maple Street
Milford, MA 01757

Re: In re Training Range and Impact Area, Massachusetts Military Reservation
EPA Docket No. SDWA I-97-1030
Final Revised Limited Authorization for Lead Ammunition Training

Dear Mr. Cody:

By letter dated September 25, 2008, the Massachusetts National Guard ("MANG"), on behalf of itself and the National Guard Bureau ("NGB"), requested that the United States Environmental Protection Agency ("EPA") modify the Scope of Work ("SOW") to Administrative Order SDWA I-97-1030 ("AO2") issued pursuant to Section 1431(a) of the Safe Drinking Water Act with respect to three small arms ranges at the Massachusetts Military Reservation ("MMR"). First, the MANG requested that its currently effective authorization to fire with lead ammunition for a pilot project at T (Tango) Range be extended past its expiration date of December 31, 2008. Second, the MANG requested approval to resume firing with lead ammunition at two small arms ranges on MMR, known as J (Juliet) and K (Kilo) Ranges, with an accompanying pollution prevention plan and proposed environmental monitoring program. In response to the MANG's request, on October 23, 2008 EPA submitted for public comment a proposal to modify AO2. That proposed modification included (1) a temporary extension of the existing authorization to fire with lead ammunition at Tango Range, and (2) an authorization for a pilot project for firing lead ammunition at Juliet and Kilo Ranges. EPA then conducted a 30 day public comment period which concluded on November 24, 2008. This letter summarizes the comments submitted and EPA's final findings, and constitutes EPA's final response to the MANG's September 25, 2008 request.

I. Public Participation

From October 23 through November 24, 2008, EPA conducted a 30 day comment period on proposed modifications to AO2. EPA received seven sets of written comments from the public during this period and a total of eleven substantive comments. A summary of the comments submitted and EPA's responses are attached to this letter. EPA carefully considered each of these comments in developing its findings and in specifying the conditions of the limited authorization for lead ammunition training.

In response to the comments received and concerns identified during the public comment period, the Best Management Practice: Operation, Maintenance and Monitoring Plans (OMMPs) for Tango, Juliet and Kilo Range were modified. In summary, the following modifications were made to the document:

1. To ensure that repairs to the top liner of the STAPP Environmental Bullet Catcher system (the "STAPP system") occur in a reasonable period of time, a time frame for making repairs has been added to the document as well as notification requirements if such repairs cannot be made.
2. To minimize damage to the system, the use of automatic weapons fire and/or tracer rounds will require increased monitoring of the STAPP system.
3. To minimize the potential for leakage, a time for removing water from the water collection system at the base of the STAPP system was added to the documents.
4. To minimize damage to the STAPP system, procedures were added for liner repairs after the use of 40 caliber hollow point bullets.
5. A section was added to the document to address General Maintenance requirements for the range including erosion and vegetation issues.
6. The document will be modified to represent the as-built drainage system for J and K range.
7. To ensure that all deficiencies identified during an inspection are addressed, procedures were added to the document requiring a formal response to inspections reports.

The revised OMMPs with the changes noted above were submitted to EPA on January 23, 2009. EPA approved the revised OMMPs and has incorporated these revised documents by reference in this modification to AO2. To ensure that the procedures of the OMMPs are followed, EPA will also require the MANG to report on any compliance issues in a report to be submitted by June 30, 2009, which will be available to the public.

II. EPA Findings

EPA's present findings are based on the information submitted by MANG to date regarding the Tango Range pilot project and on investigatory and remedial activities at Juliet and Kilo Ranges. EPA's findings were not substantially altered as a result of the comments received during the comment period. EPA's findings will be reviewed and updated as necessary based on further information, including, in particular, the final report on the results of the pilot project.

1. The preliminary studies and data submitted by the MANG indicate that:

   a. Lead has not caused significant groundwater contamination at MMR. Although lead has been detected in one well downgradient of one of the small arms ranges, no groundwater plumes have been identified.

b. The lack of significant groundwater contamination is attributable to two main reasons: (1) the geochemistry of the soil serves to retard the migration of lead, and (2) the depth to groundwater is deep, and substantial intervening soil acts as an absorbent.
c. The information does *not* support the conclusion that lead is immobile in soil. Rather, the data suggests that lead in soil will take a long time to significantly impact the groundwater. The models predict that it could take hundreds of years for groundwater to exceed drinking water standards.
d. Elevated levels of tungsten and nitroglycerin have also been detected in soils at small arms ranges. However, neither tungsten nor nitroglycerin has caused groundwater plumes at MMR. The removal of soil with elevated concentrations of tungsten and nitroglycerin, along with the establishment of best management practices including long term monitoring for these compounds, should prevent future impacts to groundwater.
e. The operational history of the STAPP system at Tango Range demonstrates, on the one hand, that the STAPP system has experienced unanticipated problems, and on the other hand, that the STAPP system is effective and that the MANG has acted diligently to investigate and address problems as they arise.
f. Based on currently available data, the resumption of lead ammunition training using the STAPP system at Tango Range has not resulted in lead contamination in pore water or groundwater.
g. Resumption of lead ammunition training at Tango Range using the STAPP system has not caused delays in the ongoing investigation and cleanup activities required by the Safe Drinking Water Act administrative orders at the Impact Area and Training Ranges.
h. Based on the above findings, continuing the pilot project for resumption of training with lead ammunition using the STAPP system at Tango Range, and initiating a similar pilot project at Juliet and Kilo Ranges, is appropriate.
i. Nevertheless, there are always uncertainties associated with developing conceptual models. Moreover, the soils beneath the ranges have only a finite capacity to act as a migration buffer, and it is not acceptable to use the soils beneath the ranges as a "containment" system for lead or nitroglycerin.
j. Consequently, pollution prevention measures are necessary to ensure that the resumption of training with lead ammunition will not result in groundwater contamination.

2. The measures identified in the revised *Tango, Juliet and Kilo Range Best Management Practice: Operations, Maintenance, and Monitoring Plans*, dated January 23, 2009, if performed as described, would be likely to accomplish the following:

a. The plans will minimize the amount of lead and other small arms-related contaminants that may migrate into the environment through the use of a STAPP system which will capture the majority of bullets fired on the range. The STAPP system also includes a containment system to capture any

rainwater runoff from the system, and to minimize infiltration into the environment.

b. The plans include an environmental monitoring plan to confirm that the environment is protected from releases of hazardous materials. The monitoring plans include soil sampling at the firing line and in front of the STAPP system, pore water sampling from lysimeters installed at the firing line and the bullet capture system, and groundwater sampling downgradient of the range.

c. The plans includes operation and maintenance plans to ensure that the STAPP system is properly maintained and functioning as designed, and a supervision plan to assure the system is inspected and operated in accordance with all requirements.

3. Continuation of lead ammunition training using the STAPP system at Tango Range, and resumption of lead ammunition training using the STAPP system at Juliet and Kilo Ranges, is necessary for the MANG, and the other agencies discussed in the MANG's June 2007 and September 2008 petitions, to meet small arms training requirements.

4. EPA issued AO2 to the National Guard Bureau and the MANG pursuant to Section 1431(a) of the Safe Drinking Water Act (SDWA), 42 U.S.C. § 300i(a). AO2 "compels the Respondents National Guard Bureau and Massachusetts National Guard to implement pollution prevention measures to abate the threat to public health presented by the past and present contamination from the Massachusetts Military Reservation (MMR) Training Range and Impact Area." AO2 ¶ 5, at 4. In particular, AO2 prohibits "[a]ll firing of lead ammunition or other 'live' ammunition at small arms ranges at or near the Training Range and Impact Area." AO2 App. A, ¶ II.A.1.a, at 30. EPA issued Administrative Order SDWA-1-2000-0014 ("AO3") to the U.S. Department of the Army, National Guard Bureau, and the Massachusetts National Guard pursuant to Section 1431(a) of the Safe Drinking Water Act (SDWA), 42 U.S.C. § 300i(a). AO3 requires the respondents thereto "to undertake Rapid Response Actions and Feasibility Studies, Design and Remedial Actions to abate the threat to public health presented by the contamination from past and present activities and sources at and emanating from the Massachusetts Military Reservation (MMR) Training Range and Impact Area." AO3 ¶ 5, at 4. Pursuant to AO3, the Army is presently conducting extensive investigation and remediation of both source area and groundwater at MMR. All live ammunition training can and must be scheduled in such a manner so as not to interfere with the ongoing investigations and cleanup required by the AOs. If a conflict arises between the schedule for training and the schedule for investigation and cleanup, the training must be rescheduled so as not to interfere with or slow down the investigation and cleanup.

Based on the above findings, EPA has concluded that there are sufficient grounds under Paragraph 125 of AO2 to approve extension of the limited pilot project for training with lead ammunition at the Tango Range, and initiation of a limited pilot project for

training with lead ammunition at the Juliet and Kilo Ranges, with specified conditions. EPA has concluded that a modification of AO2 to authorize these limited pilot projects under the conditions specified is both "necessary and appropriate" under AO2. The findings recited in this letter constitute all of EPA's findings, i.e., by authorizing this pilot project, EPA does not necessarily adopt every datum or conclusion contained in the petition or supporting documents. Finally, as noted above, this modification to AO2 to authorize this limited lead ammunition training using the STAPP system at Tango, Juliet, and Kilo Ranges does not authorize the MANG or any other agency to conduct live ammunition training at those ranges in a manner that interferes with or slows down the Army's ongoing investigations and cleanup pursuant to AO3.

V. EPA's Final Revised Limited Authorization for Lead Ammunition Training

By this letter, EPA modifies AO2 to extend the Tango Range pilot project by one year to December 31, 2009, and to authorize lead ammunition training at Juliet and Kilo Ranges until December 31, 2009. As noted above, the MANG is required to submit a final report on the results of the Tango Range pilot project by April 2, 2009, and EPA expects that the relevant stakeholders will reconvene to analyze and discuss the data generated during the pilot project. Also as noted above, the MANG is required to submit a report on any compliance issues by June 30, 2009. At this point, however, EPA is authorizing lead ammunition training at the three ranges through 2009 on the basis of the data presented to date. In other words, while EPA does not yet have an adequate record upon which to grant a long-term authorization for lead ammunition training at the three ranges, the record at this point does support a temporary authorization at all three ranges for a limited period pending a more thorough analysis after receipt of the final report from the initial Tango Range pilot period. Consequently, EPA has done the following:

1. Modified AO2, Appendix A (Scope of Work), ¶ II.A.1.a, as follows:

> a. All firing of lead ammunition or other "live" ammunition at small arms ranges at or near the Training Range and Impact Area except as provided in Appendix B <u>or C</u>;

2. Added a new Appendix C to AO2 that largely duplicates the existing Appendix B (i.e., the conditions of the original Limited Authorization for Lead Ammunition Training (LALAT) for Tango Range through December 31, 2008). The principal differences are the ranges covered (i.e., Tango, Juliet, and Kilo) and the dates (i.e., through December 31, 2009). A copy of the final Appendix C is attached for reference. (Appendix B, which pertains to the initial pilot period for Tango Range only, remains applicable according to its terms and has not been modified.)

After the submission of the reports noted above (due April 2, 2009 and June 30, 2009) and prior to the conclusion of the pilot project period (December 2009), EPA expects that the relevant stakeholders will reconvene to analyze and discuss the data generated during the pilot project. If the MANG wishes to request to renew this authorization, EPA expects to conduct a rigorous analysis of the data from the pilot

project and to invite public involvement in determining whether a renewal would be "necessary and appropriate" under AO2.

If you have any questions about the terms of this modification, please contact Lynne Jennings of my staff at 617-918-1210 or jennings.lynne@epa.gov.

Sincerely,

Ira Leighton
Acting Regional Administrator

cc: Laurie Burt, MassDEP
Mark Begley, EMC
Kent Gonser, IAGWSP
MMRCT Members

APPENDIX C TO EPA Region I
Administrative Order SDWA I-97-1030

SCOPE OF WORK
MASSACHUSETTS MILITARY RESERVATION
TRAINING RANGE AND IMPACT AREA

I. INTRODUCTION AND PURPOSE

This Revised Limited Authorization for Lead Ammunition Training (RLALAT) authorizes Respondents to conduct lead ammunition training under specified conditions for a limited pilot project on T (Tango), J (Juliet), and K (Kilo) Ranges at Massachusetts Military Reservation (MMR) on Cape Cod, Massachusetts. The RLALAT is appended to the Scope of Work of the Administrative Order, Docket Number SDWA I-97-1030 (the "Order"), issued by the United States Environmental Protection Agency (EPA) regarding the Training Range and Impact Area at MMR, and specifies the conditions under which Respondents may conduct such training and the Work that Respondents must perform associated with such training.

II. LIMITED AUTHORIZATION

A. Authorized Period: With respect to T Range, all requirements of Appendix B of this Order remain ~~in effect for the pilot period specified therein,~~ and this RLALAT is effective from January 1, 2009 to December 31, 2009 (T Range's "authorized period"). With respect to J and K Ranges, this RLALAT is effective from the date of signature to December 31, 2009 (J and K Ranges' "authorized period").

B. During the authorized period, Respondents and persons operating under their supervision may fire lead ammunition at T, J, and K Ranges, subject to the following conditions:

1. The provisions of the T Range Best Management Practices: Operations, Maintenance, and Monitoring Plan (dated January 23, 2009) and the Juliet and Kilo Best Management Practices: Operations, Maintenance, and Monitoring Plans (dated January 23, 2009) are hereby incorporated by reference. Respondents must fully perform the

activities described in the plan for the corresponding range.

2. Respondents shall continue to conduct public informational meetings throughout the authorized period and consider public comments received at these meetings. Respondents may be required by EPA to modify the operation, maintenance, and/or monitoring activities as a result of comments received during the authorized period.

3. Respondents shall provide EPA with copies of all documents or reports required by the Environmental Management Commission for consideration during the authorized period.

4. This approval is subject to periodic audits, including split samples of environmental monitoring, to be conducted by EPA or its contractors throughout the authorized period. Respondents may be required by EPA to modify operation, maintenance, and/or monitoring activities as a result of these audits.

5. Respondents shall schedule all training activities authorized by this RLALAT in a manner that does not interfere with or slow down the schedule for completing the investigation and cleanup required under the Order and Administrative Order SDWA-I-2000-0014. If a conflict arises, the investigation and cleanup activities take priority over any training, and training shall be rescheduled. Respondents shall be responsible for communicating and conferring with the Army's Impact Area Groundwater Study Program (IAGWSP) to ensure that the requirements of this paragraph are satisfied. A violation of the requirements of this paragraph

may result in modification or withdrawal of this RLALAT pursuant to Paragraph II.G.

6. This authorization is limited to firing with lead ammunition at T, J, and K Ranges, and does not authorize firing with other forms of ammunition containing other substances or constituents that could lead to groundwater contamination.

C. The conditions of Paragraph II.B are fully enforceable requirements of the Order and violations of any of the above conditions may be subject to penalties under the Order.

D. After the conclusion of the authorized period, Respondents may not fire lead ammunition at any small arms ranges, including T, J, or K Ranges, at or near the Training Range and Impact Area.

E. Respondents are responsible for supervising their own personnel, personnel from other agencies that fire lead ammunition at T, J, or K Ranges, and any contractors or consultants (including other ~~government agencies) that Respondents engage or~~ authorize to conduct any activities at T, J, or K Ranges. Respondents shall ensure that all persons conducting activities at T, J, or K Ranges comply with the requirements of this RLALAT, the Order, other administrative orders issued by EPA with respect to MMR, and all applicable law. Respondents may be liable and subject to penalties for any violations of this RLALAT, the Order, other administrative orders issued by EPA with respect to MMR, or other applicable law, caused by any persons conducting activities at T, J, or K Ranges.

F. Except as specifically stated in this RLALAT, Respondents remain obligated to comply with all the terms and conditions of the Order, including Appendix A (Scope of Work) and Appendix B (Limited Authorization for Lead Ammunition Training).

G. The TPC or the Regional Administrator may modify or withdraw this RLALAT at any time upon twenty-four hours' written notice.

Response to Comments
Proposal to Amend EPA's AO for Tango, Juliet and Kilo Ranges to allow the firing of lead ammunition at MMR
January 28, 2009

Introduction

In a letter dated September 25, 2008, the Massachusetts National Guard ("MANG) requested that the United States Environmental Protection Agency ("EPA") modify the Scope of Work ("SOW") to Administrative Order SDWA I-97-1030 ("AO2") issued pursuant to Section 1431(a) of the Safe Drinking Water Act with respect to three small arms ranges at the Massachusetts Military Reservation ("MMR"). First, the MANG requested that its currently effective authorization to fire with lead ammunition for a pilot project at T (Tango) Range be extended past its expiration date of December 31, 2008. Second, the MANG requested approval to resume firing with lead ammunition at two small arms ranges on MMR, known as J (Juliet) and K (Kilo) Ranges, with a bullet trap system, an accompanying pollution prevention plan and proposed environmental monitoring program. On October 23, 2008, EPA responded to this request and proposed modifications to AO2 subject to a 30 day public comment period. The comment period expired on November 24, 2008. EPA received several sets of comments from the public during this period. This document contains a summary of the comments received and EPA's responses.

Response to Comments

1. *Comment:* The commenter requested information on how the public can get a copy of the environmental report on the effectiveness of the bullet trap and information on the firm/agency that wrote the report. Specifically, the commenter requested information on the report/section that best describes the actual bullet trap system and the company who makes and installs the system. The commenter also asked if EPA did its own testing of this system or if EPA relied on MANG data and whether there was a non-MANG company or agency that oversaw the testing phase.

   Response: The following web site contains several documents with information responsive to the comment: http://www.mass.gov/guard/E&RC/startpage.htm. Section 3.0 in the document entitled Draft J Range Best Management Practices: Operations, Maintenance and Monitoring Plan (OMMP), prepared by URS Corporation, dated October 22, 2008, contains a description of the bullet capture system, known as the STAPP system. STAPP is also the name of the company that manufactures and installs the system: http://www.stappebc.com/index.html. There are similar descriptions of the STAPP bullet capture system found in the OMMPs for Tango and Kilo Range.

   The STAPP system at Tango Range has been in use for approximately 1 year. EPA has conducted six independent inspections of the STAPP system at Tango Range. The Massachusetts Department of Environmental Protection (Mass DEP) and the MMR Environmental Management Commission (EMC) have also conducted additional independent inspections of the system. In addition, the Mass Guard is required to collect environmental performance data including groundwater, soil and soil pore water samples and submit this data to EPA, the Mass DEP and the EMC for

review. This data provides important information on the performance of the system with respect to environmental protection.

2. *Comment:* The commenter stated "I firmly believe that all small arms fire should be conducted on government property at the former Otis Air Base property. It is a great problem for the residents of West Barnstable to have a firing range located near our homes....all range activities should be relocated to government land where it can be monitored better and not interfere with the peace of mind it's local residents. I feel like I live in a war zone here and it is nerve rattling and simply unfair to us who would like to enjoy our properties and peace of mind and spirit. I am not concerned about the makeup of bullets, but I am concerned that all fire range shooting be done on government property far away from homeowners."

   Response: While EPA understands the concerns raised by the commenter, EPA's role is to ensure that the training conducted at the MMR be conducted in a manner that is protective of human health and the environment including the sole source aquifer beneath the site. Concerns or questions pertaining to firing ranges outside of the MMR should be directed to the local Boards of Selectmen.

3. *Comment:* The commenter expressed concern about the opening of the new ranges at the MMR, as well as the continued use of the Tango Range. The commenter stated that "it is clear from the events of last Monday that the National Guard has behaved irresponsibly in following the protocols set forth in the LALAT, which were suspended that day. The particulates that were produced from the cleanup have been added to the Somerset and Sagamore pollution, in the county that has the worst air in the Commonwealth. Being a person with lung disease, I cannot afford to have any more pollution in the air, and the same goes for many thousands of elderly residents of the Cape. I would therefore recommend that you permanently suspend small arms fire at the MMR and let the Guard train with small arms somewhere that doesn't involve as fragile an ecosystem as we have on the Cape, and might also behave more responsibly."

   Response: The commenter is referring to a release which occurred during a maintenance activity to remove lead bullets from the bullet capture system as part of a mass balance evaluation conducted under the pilot. The activity was not performed in accordance with the approved OMMP Plan using the proper containment system to minimize spillage. During the activity, lead dust was observed on the ground around the equipment used to collect and sift the bullets from the bullet capture system. The MANG temporarily terminated this activity, cleaned the impacted area, and conducted sampling to demonstrate that the cleanup was successful. To ensure that this issue does not occur in the future, EPA and the EMC are requiring amendments to the OMMP that expand and reinforce the pollution prevention requirements during the maintenance of the STAPP system. In addition, EPA along with the EMC and Mass DEP will continue to closely inspect the implementation of the pilot to ensure

that all requirements of the OMMP are being followed. Finally, in its approval of continuing the pilot project at Tango, and including Juliet and Kilo Ranges in the pilot project, EPA is requiring that MANG submit a report by June 30, 2009 which reports on any compliance problems and establishes a plan to eliminate such problems.

4. *Comment:* The commenter recommended that EPA approve the MANG's request to fire lead under a pilot project at Tango Range after December 31, 2008 and to resume training at Juliet and Kilo Ranges.

   Response: After review of the information submitted and comments received, EPA has decided to approve the request with conditions as indicated in its approval letter dated January 28, 2009.

5. *Comment:* The commenter fully supported the proposal to increase the use of additional firing ranges and any other resource at the Mass. Military Reservation that will better prepare our military and other Department of Homeland Security personnel. Firing lead into the firing ranges with proper environmental protection should be approved and implemented at the earliest time possible.

   Response: After review of the comments received, EPA has decided to approve the request with conditions as indicated in its approval letter dated January 28, 2009.

6. *Comment:* The Sierra Club (the Cape Cod & Islands Group) raised concerns about the conceptual model being used to guide the fate and transport modeling effort. They view the soil as a living, dynamic ecosystem with mineral particles, nonliving dissolved and particulate organic carbon components with variable turnover times and biological organisms ranging in size from bacteria/fungi to earthworms. They believe that in the dynamic conceptual model, the soil biota play a critical role in the decay of the surface DOC/POC in the soil; release the attached heavy metals and organic contaminants into pore water and mixing the surface organic matter deeper into the mineral soil layers. They request that the MANG and regulators examine this alternative conceptual model and explore its implications for the monitoring program and Best Management Practices (BMPs).

   Response: EPA, EMC and Mass DEP agree with the view presented by the Sierra Club of soil as a dynamic ecosystem, with soil biota possibly exerting a significant influence on contaminant transport. The MANG and the regulatory agencies recognize that some of the current modeling is highly simplified, particularly that applied to assess the potential impact of contamination in surface soil on underlying groundwater. The protocols followed to date draw heavily from EPA soil-screening guidance (EPA, 1996), which is conditioned by broad experience with common contaminants. At the same time, it is recognized that there is less experience with some of the contaminants of concern at Camp Edwards (e.g., explosives, propellants,

heavy metals), and that research is needed in order to identify and model the processes that control their mobility in the environment. The conceptual – as well as the mathematical and computational – models are under review and revision in an effort to improve their predictive capabilities. The MANG, its contractors, and the regulators are all working together to advance the understanding of contaminant transport processes in this setting. With encouragement from the EPA, EMC and Mass DEP, the Army has performed extensive work to characterize the behavior of metals (e.g., Clausen, Korte, et al., 2007; Clausen, Taylor, et al., 2007), propellants (e.g., Clausen, Scott, et al., 2008), and explosives (e.g., Lever, et al., 2005) in Camp Edwards soils. These data are available to support more direct, empirical approaches, as well as to constrain and/or calibrate transport models. It is expected that the ability to predict the fate of range contaminants will continue to improve, and consideration of the processes noted by the Sierra Club (i.e., those mediated by soil biota) should certainly be a part of that development.

It should be noted that the distance between "static" models of the type currently in use for soil screening assessments and "dynamic" models of the type advocated by the Sierra Club may not be as great as it may at first appear. Transport modeling typically adopts a "macroscopic" view of the processes of interest, because the motivation for the modeling effort is also of a "macroscopic" nature (e.g., What is the expected average concentration of a particular contaminant in groundwater at some point of compliance?). The underlying "microscopic" mechanisms often are not represented explicitly. However, that does not mean that they are not accounted for. For example, Army's current research on nitroglycerine suggests that the compound is readily degraded once in aqueous solution. For the purpose of transport calculations, this process might be represented by some idealized phenomenological model, such as a first-order reaction, characterized by a single rate constant. If such a model is supported by the appropriate laboratory experiments, and the predictions are consistent with field observations, one can often proceed without a detailed understanding of, or an explicit model representation of, the underlying mechanisms of degradation (e.g., microbially mediated redox reactions, phototransformation, etc.) However, it would be implicit in this sort of "macroscopic" model that it captures the essential behavior of the underlying "microscopic" processes, which might include the very things noted by the Sierra Club (i.e., the action of soil microbes and invertebrates). In constructing the appropriate "macroscopic" models, of course, it is often of great utility to understand as much as possible about the underlying "microscopic" processes, and, for that reason, the MANG is encouraged to consider the conceptual model as outlined by the Sierra Club.

The EPA, EMC and Mass DEP believe that the description of the conceptual site model (CSM) for the Small Arms Ranges is not adequate, and is requiring the MANG to add a description and graphical depiction of the CSM to the OMMP for J and K ranges. The CSM should show that lead is captured and retained in the bullet trap. A "blow-up" of the soil horizons on the range floor would enhance the depiction.

The Sierra Club's concerns are of particular note for a range where the native soil is the primary capture medium; therefore, a more dynamic CSM will be considered for any range with a bullet capture system proposing to use that design.

7. *Comment:* The Sierra Club noted that it found it interesting that the UXO Working group is considering what spatial components of a range are significant: firing line, targets, berms behind targets and the fan-shaped no use region behind the berms. They recommended that the military and regulators should consult soil ecologists on the appropriate spatial/temporal scales to implement a monitoring program based on a dynamic conceptual model to see if it differs significantly from the current monitoring program designed using the static conceptual model. In addition to the range Best Management Practices (BMPs), one needs to consider if there are important temporal components in contaminant recycling and vertical transport through the aerated zone in the soil (vadose zone). Vadose zone modeling of contaminant transport appears to be in a much more primitive state than saturated zone modeling.

   In the short term the dynamic and static conceptual models will likely yield similar predictions for the monitoring program and BMPs, but over the longer term where cumulative impacts occur and variable climatic patterns come into play the predictions are likely to differ. That is why we are recommending that the MANG and regulators examine this alternative conceptual model and explore its implications for the monitoring program and range BMPs. It might be worthwhile conducting a vulnerabilty analysis to identify the appropriate temporal/spatial scales for evaluating different the threats associated with different types of ranges (obviously firing at a STAPP system target from a fixed firing line will differ from troops maneuvering through an area shooting at multiple targets at different heights). The fate and effect transport models used to predict the movement of contaminants from the surface soil into the groundwater are likely to differ between the dynamic and static conceptual model perspectives.

   Response: The Regulators support continued improvement in range management practices, as well as in the scientific basis for the monitoring program. Modeling performed in support of decision making will continue to be subjected to technical review. MANG will be encouraged to consider the dynamic soil processes noted by the Sierra Club as the modeling tools evolve.

   It is agreed that many aspects of vadose-zone modeling are not as well developed as for the saturated zone. Because of the complexity of vadose-zone transport processes, the MANG and the regulatory agencies have relied in part upon direct field measurements, rather than entirely on modeling. In particular, lysimeters are being used to test the conceptual site model. The lysimeters capture pore water that has passed through the contaminated surface soil layer, and allow for direct analysis for the water chemistry.

The EPA, EMC and Mass DEP view the soil as a valuable resource, having no significant ability to restore itself from metals contamination, thus having the potential for cumulative impacts. The agencies do not view soil as an expendable metals "sink" whose value is just to filter and adsorb lead and other metals. It is agreed that the soil ecosystem is complex and dynamic. It should not be viewed as having a sole environmental function simply to assist in making sure lead does not make it to groundwater.

8. *Comment:* The Sierra Club requests that the leakage of water into the STAPP bullet trap system be resolved and that the source of the high lead, copper and antimony levels in the collection water is addressed.

   Response: All involved agree that the water collection issue in the STAPP system at Tango Range needs to be resolved. It is important to note that the STAPP systems at Juliet and Kilo Range have not experienced similar problems. This observation helps in the assessment of Tango range. Recently, the STAPP system at Tango was inspected by the manufacturer. The manufacturer has agreed to replace the top liner as it is believed to be too short for the structure and may in fact be the cause of the water collection. The top liner replacement is scheduled to occur in April 2009. If this change does not resolve the issue at Tango, EPA will continue to work closely with the MANG to resolve this issue.

   The levels of lead, copper and antimony in the collection water is believed to be from the bullets themselves. The OMMP plan has been modified to ensure that water collecting in the system is promptly removed within 72 hours. Until the water collection issue is resolved, EPA, Mass DEP and EMC will continue to closely review the monitoring data from the lysimeters beneath the STAPP system to verify that the system is not leaking and negatively impacting the environment.

9. *Comment:* Given the detection of dinitrotoluene isomers in the surface soil and groundwater at Demo 1 and some of the plumes located in the Central Impact Area (CIA), the Sierra Club requests that the soil and groundwater be analyzed for all five isomers of DNT. Furthermore, they suggest that the regulators work with the state Health Department in Wisconsin to develop cleanup standards based on the experience at Badger Ammunition Plant.

   Response: Analyses of soil and groundwater samples to date have focused on 2,4-DNT and 2,6-DNT, based on the fact that technical grade DNT is approximately 95% composed (by weight) of these two isomers, and because various soil- and water-quality standards have been established for them. Therefore, it is generally believed that soil and groundwater characterization based on the predominant isomers provides adequate support for remedial design and/or long-term monitoring. However, EPA and Mass DEP are aware that there are known examples (e.g., at Badger Army

Ammunition Plant, as cited by the Sierra Club) where the less-common isomers have been detected in groundwater at concentrations significantly greater than the predominant isomers. EPA and MassDEP agree with the Sierra Club that it is worthwhile to establish whether or not the less-common isomers are present in Camp Edwards soil and/or groundwater at detectable concentrations and has been working with the Army's Impact Area Groundwater Study Program to develop a sampling plan. Thus far, we have reached agreement to sample a subset of groundwater monitoring wells around the site including those where DNT has already been detected and some that are down gradient from the small arms ranges. These selected wells have been analyzed for all six isomers of DNT using the analytical lab at Badger which is capable of achieving the low level detection limit necessary. Preliminary results indicated 0.216 ppb of 2,4-DNT detected at Demo 1 (MW 31), all other results were ND. Data validation has not yet been completed. If data validation confirms these results, the regulators do not believe that additional sampling is necessary at this time.

10. *Comment:* The Sierra Club noted that they accept the need for the military to conduct realistic training, since their troops are being sent into harms way in the mid-east. The Sierra Club wants to make sure that the contaminants stay either in the surface soil or STAPP system/berms, so that conducting an accurate mass balance is critical to make sure that we don't pollute our sole source aquifer for drinking water. Given the cost and time required to treat polluted groundwater, pollution prevention needs to be our main goal in the training at the 3 current ranges and future proposed ones. The lessons learned from the operation of the Tango range will certainly inform the process as we move forward with the Pilot Test. The fact that the contaminants stay either in the surface soil or STAPP system berms and suggest that an accurate mass balance is critical to make sure that we don't pollute our sole source aquifer for drinking water.

    Response: The EPA, EMC and Mass DEP agrees with the Sierra Club and will continue to work closely with the MANG to minimize the environmental impacts of training, and to advance the scientific basis for development of sound range management, remediation of past or future impacts, and design of protective monitoring. We agree that the mass balance is a critical piece to understand the effectiveness of the bullet capture systems at MMR. EPA has notified the MANG that the mass balance work conducted to date has not been adequate. A revised plan for the implementation of the mass balance will be submitted to the regulators for review and approval and will be implemented and evaluated before any final decisions will be made by EPA.

11. *Comment:* The commenter requested the regulators take a more objective position on this issue and pursue a more precautionary approach to protect the public and the natural environment. One component of this precautionary approach would be to close the gap between the scientific state of technology and that used to support the cleanup process. The commenter suggests that EPA use the ecological risk

assessment process to supplement the health risk assessment techniques currently being used at Camp Edwards.

Response: EPA believes that it has taken a very objective and cautionary approach in responding to the requests by the MANG to resume training with lead bullets at MMR. We have consulted, and continue to consult with several experts in the field of bullet capture systems and believe that the STAPP system is considered a state of the art system for managing bullets at small arms ranges. We have also consulted with numerous experts in the field of analytical sampling methods and have implemented innovative methods to sample and model the impacts from these contaminants. EPA's approval of the MANG requests to resume training with lead bullets under a pilot program with numerous pollution prevention requirements is another example of the cautionary approach to allowing these activities at MMR. EPA shares the same concerns as the commenter and will continue to take measures to ensure the activities at MMR are protective of human health and the environment.